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PRACTICES

Water, Heritage and Sustainability in Practice: the cases of Rochdale and Wrocław

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ABSTRACT

Scholars argue that culture can be considered a fourth pillar in sustainable development, however culture is often overlooked in contemporary sustainability discourses and practice. By considering water management and heritage together, practitioners can begin to address this lacuna. It is important to recognize the aesthetic and social importance of water as well as its technical and economic contribution to historical urban development. Presenting two European case studies, this article examines the way in which water management has shaped the design of urban areas and people's interactions with those areas. In the first case, in Rochdale, Manchester (UK), a project that included the deculverting of the River Roch in order to reduce flood risk provided other environmental and social benefits. In the second case, the city of Wrocław, a major flood has led to rethinking the form and function of the city and how citizens engage with it. Lessons from the two cases make it possible to offer recommendations for practice. In an era when climate change demands greater resilience, more attention must be paid to the intimate relationships between water and heritage.

KEYWORDS

Water; Heritage; Sustainability; Flood Risk; Urban Areas.

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Introduction

As a fundamental part of the landscape, water has influenced the design and use of urban spaces over time. Similarly, heritage—encompassing physical forms and customs and attitudes—is also a key part of the urban landscape.¹ Yet the two, water and heritage, are rarely considered together although doing so can provide creative inspiration. For example, efforts to protect cultural heritage from excess water have enabled innovation in urban flood management, such as the erection of temporary barriers to reduce flood risk in Cologne that do not conflict with the city's heritage landscape.² Similarly, there has been work on the use of natural heritage to protect wider urban environments from flooding.³

Such examples are underpinned by a fundamental change in attitudes towards water management in Europe⁴. European policy has been increasingly focusing on natural water management, integrated strategies and nature-based solutions to combat current flood risk, address water quality issues, and tackle future climatic change. The Water Framework Directive (WFD) and initiatives such as Natura 2000 have helped to shine a light on the use of integrated water management practices at recognized natural heritage sites. Furthermore, the local level and strengthening good water management practices by driving local-level action are growing in prominence. The Urban Water Agenda 2030, for example, was a joint initiative of the European Commission and local governments to safeguard Europe's water resources and strengthen the implementation of European Union water legislation. It aimed at fostering sustainable urban water management in cities through facilitating improved policies and practices at local level and by promoting inter-city exchanges.⁵

A deeper understanding of the interplay between heritage and water may help to enact such a shift in sustainability and water, and may help to

1. Although definitions of "heritage" vary, it generally encompasses both tangible (physical) artefacts as well as more intangible (including "spiritual") aspects such as customs and behaviour. UNESCO notes that "cultural heritage is the legacy of physical artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations." This wide definition opens up several possibilities for the intersection of water and heritage in practice. The two case studies presented in this article highlight both tangible and intangible aspects of cultural heritage and the relationship to water management. See "Tangible Cultural Heritage | United Nations Educational, Scientific and Cultural Organization," accessed January 21, 2019, <http://www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage/>; see also Willem J. H. Willems and Henk Van Schaik, eds., *Water & Heritage: Material, Conceptual and Spiritual Connections* (Leiden: Sidestone Press, 2017).

2. Abhas K. Jha, Robin Bloch, and Jessica Lamond, *Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century* (Washington DC: World Bank Publications, 2012).

3. See e.g. Council of Europe, *Heritage for Development in South-East Europe* (Council of Europe, 2014).

4. Richard Stinshoff, "Beyond the Industrial Revolution: The Transformation of Britain's Canals and Their Cultural Meaning," in *Thinking Northern: Textures of Identity in the North of England*, ed. Christoph Ehland (Amsterdam, New York: Rodopi, 2007), 257–78.

5. "Urban Water Agenda 2030 | Home," accessed January 21, 2019, <http://urbanwateragenda2030.eu/>.

cement culture as the fourth pillar of sustainability.⁶ Approaching sustainability in this way may also shed light on urban development patterns and citizens' relationships with the water that flows through their cities and sustains their lives. However, there are few useful examples for the practitioner community that show how water and heritage can be considered together. Only by having such an understanding can we begin to make solid plans for a more sustainable and equitable water management system based.

This article presents two European case studies that showcase the way in which flood risk shapes the design of urban areas and the relationship between citizens and water over time. Both cases show the multifaceted ways in which water and heritage can be related but in the two cases, the relationship differs. We begin by considering Rochdale (United Kingdom) and follow the deculverting of the River Roch in the town center. The project revealed historic bridges that had been hitherto concealed and that also reduced flood risk and helped realize wider sustainability benefits to the environment, the economy, and people. Our second case study in Wrocław (Poland) examines the impact that floods have had on the form and function of the city as well as the way in which urban flood risk managers can encourage approaches that change how *Wrocławianie* relate to water.

Revealing the Roch: Context

Rochdale is a town of approximately 159 km² and a population of just over 200,000 located in the north-west of England and part of the Greater Manchester Combined Authority. Flooding is one of the most significant risks across Greater Manchester and the town of Rochdale is particularly affected, as it is the only one of Greater Manchester's towns that has a river running through it—the River Roch, from which Rochdale takes its name. The river has several tributaries and the fluvial risk they pose has a negative impact on economic opportunities and housing in an area where the watercourses rise quickly during periods of intense rainfall. In addition, Rochdale has significant surface water flood risk in certain areas owing to an abundance of sealed surfaces and intense rainfall.

Historically, Rochdale was an important place in the north-west of England due to its location in a valley where a river crossing could be created to facilitate trade between Yorkshire and Manchester.⁷ In the Medieval era, Rochdale was renowned for its wool industry and the town began to grow because of the location's transportation possibilities. Originally, the town center was mainly on the south bank of the River Roch; however, expan-

6. Jon Hawkes, *The Fourth Pillar of Sustainability: Culture's Essential Role in Public Planning* (Champaign, IL: Common Ground, 2001); Willems and Van Schaik, *Water & Heritage*.

7. Ian Miller and Chris Wild, "Rochdale Bridge, Rochdale. Archaeological Deskbased Research and Field Survey Report" (Oxford Archaeology North, 2011).

sion occurred to the north of the river during the Medieval period and the Rochdale Bridge was constructed to connect the town and ease trade routes. Over several centuries, phases of redevelopment were undertaken to expand or replace parts of the Rochdale Bridge. Such changes were necessary as the town grew in size and importance particularly during the Industrial Revolution; Rochdale's population exploded from 8,452 in 1801 to 43,668 by 1860.⁸

Throughout the nineteenth century, the Roch was an open watercourse running through Rochdale town centre. The Rochdale Bridge accommodated regular traffic and, by 1882, the Wellington Bridge was also added. However, the Roch was polluted and the resultant stench, as well as a need to construct a new tram stop, led to culverting of the area between the two bridges. Consequently around 500 m of the Roch was culverted between 1904 and 1924 using the then-pioneering Hennebique reinforced concrete system.

Between 1995 and 1997, repair work to the culvert exposed the Rochdale Bridge—reputedly once the widest in the United Kingdom—which had been hidden under the culvert. Community interest in the bridge was piqued, although a campaign to have the bridge permanently exposed and conserved proved unsuccessful. The proposal was reconsidered over the following decade. By 2010, Rochdale Borough Council had commissioned an archaeological survey which revealed that the Rochdale Bridge underneath the concrete culvert could be considered to be a series of bridges that were constructed in five distinct architectural styles.⁹ Although the Medieval phase could not be exactly dated, evidence of a pointed Gothic arch typical of the period led to the conclusion that the Rochdale Bridge was “a rare example of an early urban bridge.”¹⁰ Additionally, the archaeological survey identified early parts of the reinforced concrete culvert of heritage significance as one of the earliest applications of the Hennebique system. This posed a conundrum in terms of what to preserve and what not to preserve when removing the culvert from the River Roch.

As proposals to deculvert the Roch gained momentum following the survey, the main protagonists connected the work to wider sustainability objectives. Not only could the deculverting of the Roch enhance local heritage, particularly through connecting to sites that pre-dated the culvert including the Grade I listed Rochdale Town Hall¹¹, but the process could also help to enhance the river ecology, reduce flood risk, and encourage a wider regeneration of the area. Christened “Revealing the Roch,” the pro-

8. Edward Baines, *The History of the County Palatine and Duchy of Lancaster* (Abingdon-on-Thames: Routledge, 1868), 502.

9. Miller and Wild, “Rochdale Bridge,” 34-38.

10. *Ibid.*, 40.

11. Historic England uses a grading system to classify protected heritage assets. Grade I listing denotes a structure that is of exceptional interest.

ject became central to a major regeneration strategy.¹² Therefore, sustainability objectives that address heritage could, in this case, form a creative project with significant economic benefits. The next section describes the work in more detail.

Revealing the Roch: Project Description

At a cost of almost £5 million, Revealing the Roch attracted funds from multiple sources because the project brought together ecological enhancement, heritage and flood risk management. The Heritage Lottery Fund, which has invested more than £6 billion in the UK to protect heritage, provided around one-third of the project's funds because of the emphasis on local heritage. The Environment Agency also provided significant funds because the project promised to helping realize WFD objectives: the Roch, according to the Environment Agency, was failing in a number of respects relating to wildlife attraction and pollution.¹³ In addition, funding for the capital works came from locally available flood funding sources such as the local council and the North-West Regional and Coastal Flood Committee particularly because of the argument that the project would remove debris that coalesced underneath the culvert and could block the river. Therefore, combining the multiple interests around flooding, heritage, and ecology enabled a range of diverse funding agencies to be brought together.

Revealing the Roch consisted not only of the physical work of deculverting the river but also encouraging community members to become interested in and knowledgeable about the historic bridge and the natural heritage of the waterway. The physical works provided an intuitive link to the pre-industrial buildings located in the town center, which had long since lost their orientation towards the hidden river: the pre-culvert building lines did not directly follow the roadworks over the culvert. Revealing the Roch eventually led to a realignment of the esplanade and improvements to the adjacent public realm through the removal of two sections of the 1903 reinforced concrete culvert. In addition, the project led to the restoration and conservation of the Medieval bridge [Fig.1]. Additionally, the natural bed substrate, which had been lined with concrete, was restored through the addition of natural sediments. The bank height was reduced to bring people closer to the river. The deculverting of the river therefore brought significant townscape benefits by relating pedestrian movement to the river. This, in turn, helped reconnect Rochdale's built environment to topography, landscape, and existing heritage assets. Consequently, Rochdale Borough Council also thought that socio-economic benefits could be

12. James Holloway, "Environmental Objectives and Selected Case Studies for De-Culverting the River Roch in Rochdale," Report for Rochdale Borough Council and the Environment Agency (Cranfield: River Restoration Centre, 2012), 16.

13. Ibid., 5.



FIG. 1

Ongoing work to the Rochdale Bridge during the Revealing the Roch Project: February 2016. Source: ©David Dixon <https://www.geograph.org.uk/profile/43729> and licensed for reuse under CC-BY-SA 2.0 via [geography.org.uk](https://www.geography.org.uk)

derived from increased footfall businesses. Further benefits were found around the educational opportunities with schools and the wider community in showcasing Rochdale's wider heritage: a drop-in center, for example, was established close to the site for interested individuals to find out more about the project. A time-lapse video helped share the ongoing work involved in removing the culvert [Fig.2].

The public opening during June 2016 was marked by a day of celebratory events to which thousands of people turned up.¹⁴ Revealing the Roch received several national awards including recognition at the national Royal Town Planning Institute awards for excellence in planning the natural environment (2016). In light of its various aims around heritage, ecological restoration and flood risk reduction, the project has also delivered tangible benefits. During December 2015, the deculverting project was tested early on when the north-west of England experienced significant floods. In Rochdale, the river level for the River Roch on 26th December was 1.1 m higher than anything previously recorded.¹⁵ Rochdale's town

14. N.n. "Thousands pack town centre for 'Revealing the Roch' party", Rochdale Online, 25 June 2016, <https://www.rochdaleonline.co.uk/news-features/2/news-headlines/103735/thousands-pack-town-centre-for-revealing-the-roch-party>.

15. Greater Manchester Combined Authority, "Flood Investigation Report: Greater Manchester. 26 December 2015," 2016, <https://www.greatermanchester-ca.gov.uk/media/1261/boxing-day-flood-report.pdf>.



FIG. 2 Time-lapse video of the river Roch deculverting <https://youtu.be/x2AQkEG3O8Y>.

center was flooded; however, it was felt that despite the damage to 54 properties, the deculverting work enabled water to re-enter the river and to flow more freely through the watercourse, limiting the flood's impact.¹⁶

Revealing the Roch addressed sustainability by uniting economic growth with environmental and social objectives as the so-called "triple bottom line".¹⁷ Revealing the Roch exemplifies how culture can be considered sustainability's fourth pillar. Of particular interest to practitioners, it also demonstrates the advantages of pooled funding resources and of significant urban design interventions. We now turn to a consideration of the Odra River Basin for a different conceptualization of heritage and water in a context where floods can subtly shape how citizens interact with urban redevelopment.

The City of Wrocław

The Odra River runs through the city of Wrocław and is the second-largest river in Poland with a length of 840.9 km. The Odra Basin has a total area of 124,049 km². Approximately 86.4% of this area falls within Poland's territory; 5.9% and 7.7% are within the Czech Republic and Germany, respectively. The Odra River forms approximately 162 km of the Polish-German border.¹⁸ Its largest tributaries are located within Poland and have their sources in the Sudetes (Sudety) Mountains or in the foreland. The mountain character of these tributaries (as well as those located in the Czech Republic) often cause floods in the river basin.

Given its size, the Odra River has significant social and economic value for Poland in general and for Wrocław in particular. Historically and in the

16. Ibid., 116.

17. John Glasson, Riki Therivel, and Andrew Chadwick, *Introduction to Environmental Impact Assessment* (Abingdon-on-Thames: Routledge, 2013).

18. Z.W. Kundzewicz, "The Flood of the Floods—Poland, Summer 1997," In *The Extremes of the Extremes: Extraordinary Floods*, proceedings of a symposium held in Reykjavik, Iceland, July 2002. (Reykjavik: 1A11S Publ. no. 271., 2002).

present, it has influenced business development, social integration, urban space and climate. However, it is not used as a source of drinking water for the population.¹⁹

Because of the prominence of the river and its many bridges and crossings, Wrocław is known as the “Venice of the North”. It provides a rare example in Poland of a close relationship between urban fabric and river. The river and its tributaries form very important ecological passageways, with seven national parks located within the river’s catchment area; six of the parks lie within Poland and the seventh within Germany.

Multiple floods have affected the Odra River basin over the years. However, the flood of June 1997 proved to be the biggest natural disaster to strike Poland in a period of 1000 years, and was considered a hydrological rarity covering the entire length of the river.²⁰ It was triggered by a period of constant heavy rain, when absolute water level maximums were exceeded for four to seven days in the upper parts of the river. The existing flood protection system of embankments, weirs, reservoirs, relief channels, and polders, was unable to cope. The flood took place in three phases:²¹

- First, in the upper river basin and its highland tributaries, fast-moving runoff made water levels rise up to 4m within half a day.
- The flood swept downstream into the cities of Racibórz, Opole, and Wrocław. Wrocław’s flood protection system proved inadequate for a peak flow rate greater than its capacity of 2,400 m³/s.
- The third phase affected the lower end of the river and the boundary area between Poland and Germany. Protective measures were more successful here, where the time delay allowed for embankments and dikes to be fortified.

The flood’s catastrophic impact included \$2-4 billion in economic losses, 54 mortalities, and 2,592 flooded cities and villages in Poland. Additionally, 162,000 people were affected, and 665,000 ha of land including 450,000 ha of agricultural land were flooded.²² In Wrocław, 40% of the city’s surface area was ravaged, with major damage to infrastructure.

The intensity, longevity, and areal coverage of the flood was not particularly high in comparison to world standards,²³ however the local impact was devastating and made worse by inadequate preparation.

19. The source of the city’s drinking water comes from the Oława River Valley, which is supplied with water from the river Nysa Kłodzka. The city’s water resources include 1,026 hectares of meadows and ponds in the south-east of Wrocław.

20. Kundzewicz, “The Flood of the Floods—Poland, Summer 1997,” 149.

21. *Ibid.*, 148.

22. *Ibid.*, 148.

23. *Ibid.*, 150.

The Impact of Floods on Urban Development

The 1997 flood and others preceding it are examples of the difficulties Wrocław has experienced with the Odra River. The great flood of 1903 destroyed over 50% of the city, forcing the construction of a flood system, which still structures the city. In the wider Odra basin, 32 weirs and 32 sluices were constructed whilst an additional flood canal was created in the city of Wrocław with a navigable canal running parallel.²⁴

Wrocław has been taking actions and measures to shape and strengthen its identity as a “riverside city” and “Venice of the North,” and seeks to use the river’s potential to benefit the economic, touristic and recreational development of the city [Fig. 3]. However, the risk of flooding heightens the challenges faced by the city of Wrocław and other riverside cities in Poland, especially because recent decades have seen considerable flux in relevant laws. Legislative issues, along with a shortage of financing, present major obstacles to effective long-term planning.

For many years, the city was committed to a clear flood protection policy, which protected developed areas primarily through engineered flood defenses and prevented the use of areas exposed to floods. The 1997 flood brought together city authorities and governmental entities and they began cooperating on a more comprehensive effort to protect Wrocław



FIG. 3

A renovated boulevard on the River Oder. Source: Wrocław_Official. Licensed for reuse under Creative Commons via Flickr <https://creativecommons.org/publicdomain/mark/1.0/>.

24. Alfred Dubicki, Józefa Malinowska-Malek, and Kinga Strońska, “Flood Hazards in the Upper and Middle Odra River Basin – A Short Review over the Last Century,” *Limnologica*, 11th Magdeburg Seminar, October 2004 on Waters in Central and Eastern Europe: Assessment, Protection, Management, 35.3 (2005), 123–31.

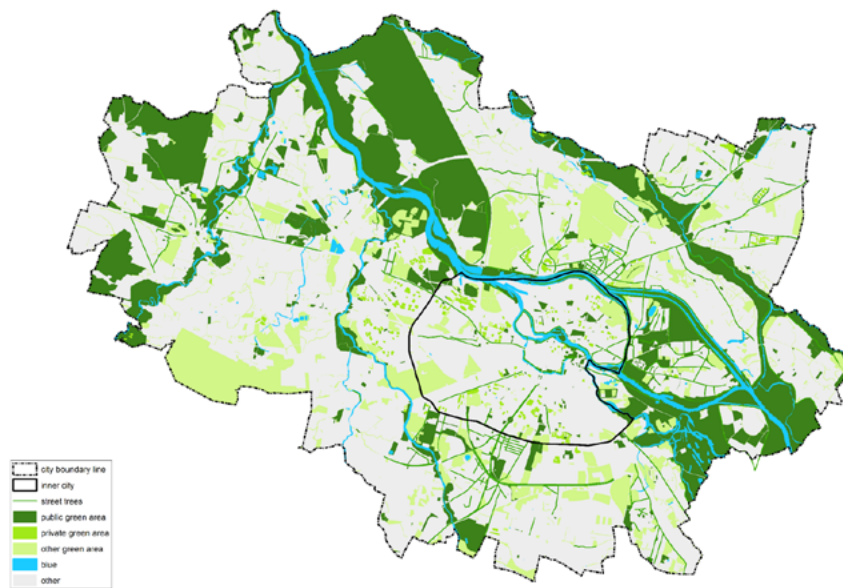


FIG. 4 Map of blue-green infrastructure across the Wrocław area. Source: by permission of Municipality of Wrocław.

from floods. They modernized the Wrocław Water Floodway System by improving river embankments, boulevards, and polders. They also reconstructed hydro-technical structures such as synchronized dams, increased the capacity of the Odra riverbed, and defined land use and management practices for exposed areas. These efforts had a positive impact on the city especially in terms of economic impact, creating social ties, and environmental awareness.²⁵

In terms of infrastructural resilience, Wrocław currently features a high degree of river flood protection with forty kilometers of embankments and riverbeds adjusted to a flood wave with a flow of 3,100m³/s, in line with the Floods Directive 2007/60 /US and the “Flood Risk Management Plan for the Middle Oder River Basin.” Moreover, the city is becoming more and more reconciled to co-existence with the river, rather than viewing it as an adversary to be kept out. This new approach can be seen in green infrastructure, such as trees and public parks, across the urban area [Fig. 4].

Additional measures include building agricultural resilience. The flood of 1997 resulted in tremendous loss of agricultural land, therefore Wrocław is working to maintain and boost agricultural traditions and to increase their retention capacity and resilience to floods. There are more than 1000 farms within the city limits, and urban agricultural land constitutes more than 18% of the city's surface area making a considerable contribution to the food offer. Allotment gardens are becoming increasingly popular, covering 5% of the city's surface area and corresponding to 23.1m² per citizen (well above the national average of 7.5m²).

To ensure the sustainability and longevity of its measures, Wrocław utilizes public consultation and stakeholder engagement as valuable resources

25. The World Bank. “Improving Poland's Odra River for Safety”, 2015, <https://www.worldbank.org/en/results/2015/02/05/improving-odra-river-for-safety-poland>.

for the creation of new possibilities for building ownership and the further development of “riverside identity”. City authorities are also considering analyzing the feasibility of having waterbuses along short sections of the river.

Such efforts underscore the importance of water—in this case, of flooding—to the cultural identity of urban areas and how water significantly shapes urban development over time. Whilst the Rochdale case showed that water management features can themselves form an important heritage asset, the Wrocław case demonstrates the way in which water management practices over time shape urban form and how people relate to the city in which they live. This is in stark contrast to approaches in the nineteenth and twentieth centuries that denied the existence of water, changed river flows, or tried to hold river water back from urban areas.²⁶

Conclusion

The case studies emphasize two different ways that water heritage can become a key part of people’s engagement with cultural heritage and part of wider sustainability and resilience agendas. Rochdale shows how water heritage (the bridge and the revealing of the hidden river) can be used to promote regeneration and a closer relationship between people and nature. Wrocław shows how water can be used to create a riverside identity—the river is continually productive for the city and a range of practical initiatives have helped to increase flood resilience and bring people closer to the river.

In Rochdale, citizens have been encouraged to become involved in understanding the physical changes in their area through extensive public consultation. A closer connection to water has assisted in developing the physical urban area as well as ensuring that citizens have a stake in the way that water is managed. The Rochdale case also demonstrates that the integration of various concerns around water and heritage can help leverage multiple funding sources to bring a project to fruition.

Recognising water and heritage together covers different aspects. These include physical assets, as shown in the Rochdale case with its Medieval bridge, to the more intangible aspects of people’s relationship to water in urban areas like Wrocław. Therefore, there are several sub-themes that can be realized in practice when considering water and heritage as an overarching narrative theme including: urban design improvement, environmental sustainability and resilience.

26. See, for example, Harold L. Platt, *Sinking Chicago: Climate Change and the Remaking of a Flood-Prone Environment* (Temple University Press, 2018).

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